

# Renal Phaeohyphomycosis: Aureobasidium Pullulans Infection Caused by Instrument Inoculation in a Healthy Patient - A Case Report

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## ABSTRACT

**Introduction:** Aureobasidium pullulans, a black yeast-like dematiaceous fungus. Most of these infections commonly affect the immunocompromised patients; however, post-instrument inoculation was extremely rare. This is the first report of renal phaeohyphomycosis by A. pullulans after stone surgeries reported worldwide, despite a thorough literature review.

**Case Report:** A 29-year-old immunocompetent native lady, with underlying bilateral grade II renal parenchymal disease, was referred for right staghorn calculi and big left ureteric stone with bilateral hydronephrosis back in 2016. She underwent right percutaneous nephrolithotripsy (PCNL) and left ureteroscopic surgery (URS). Intra-operatively, 90% stone clearance for the right kidney and complete stone clearance was achieved over the left ureteric stone. Blood investigation showed Urea was 8.1 and Creatinine was 200 respectively. There was no growth in Urine C+S sent intra-operatively. Post-operatively, she did a DTPA scan which showed moderate impaired right kidney function (28ml/min-69%) with a non-functioning left kidney (13ml/min-13%). Her condition and renal function had been closely monitored during follow-up in the urology clinic. During follow-up, computed tomography urography (CTU) reassessment in 2018 showed residual right renal stones and resolved left hydronephrosis. Subsequently, she underwent right retrograde intrarenal surgery (RIRS) and ureteric stenting. Intraoperatively, complete stone clearance for the right upper and middle pole; there were a few blackish tubular foreign bodies seen at the right lower pole which were extracted and sent for investigations. Interestingly, the histopathology (HPE) reported as blood clots while the fungal PCR done by the Institute for Medical Research (IMR) showed Aureobasidium pullulans DNA detected. Post-operatively, she completed a one-month course of anti-fungal antibiotic and was discharged home well. Subsequent urine culture was cleared and CTU assessment showed no evidence of stone recurrence or foreign bodies.

**Discussion and Conclusion:** Renal phaeohyphomycosis caused by Aureobasidium pullulans secondary to post-instrument inoculation is first reported worldwide in an immunocompetent native lady.

**Keywords:** Phaeohyphomycosis; Aureobasidium pullulans; Fungal infection; Inoculation; Staghorn calculi; Percutaneous nephrolithotripsy (PCNL); Retrograde intrarenal surgery (RIRS); Ureteroscopic surgery (URS).

## 1. Introduction

In 1974, the term 'phaeohyphomycosis' was first described by Ajello et al., with the definition of superficial cutaneous infections, subcutaneous, disseminated, visceral, and systemic infections caused by filamentous fungi with melanic pigment [1]. The risk factor of immunocompromised status is associated with life-threatening fungal infection, but rising cases have been reported in the immunocompetent population [2]. Route of post-instrument inoculation was extremely rare and this is the first report of renal phaeohyphomycosis by Aureobasidium pullulans after stone surgeries.

Tropical countries like Malaysia with humid weather provide a good habitat for the fungi.

These fungi are commonly distributed in the environment especially in soil, wood, and decomposing plant debris. Despite traumatic inoculation being reported as the most common route of transmission, urinary system seeding may occur through hematogenous route or instrument inoculation. Clinical presentation of phaeohyphomycosis can be asymptomatic or commonly presented as dermatological manifestations [3].

This study describes a rare case of renal phaeohyphomycosis in an immunocompetent patient with complicated bilateral renal calculi disease, diagnosed with the aid of CTU and successfully treated by stone surgeries and antibiotic therapy.

## 2. Case Presentation

A 29-year-old immunocompetent native lady, with underlying bilateral grade II renal parenchymal disease, was referred for renal calculi back in 2016. Clinically, she presented with bilateral loin pain with no dermatological lesions. Blood investigation showed Urea was 8.1 and Creatinine was 200 respectively. Her plain CTU showed a right full staghorn calculus and a big left ureteric stone measuring 2.5 cm with bilateral hydronephrosis (Figure 1).



**Figure 1.** The patient's CTU showed right staghorn and left ureteric calculi with hydronephrosis

She underwent right percutaneous nephrolithotripsy (PCNL) and left ureteroscopic surgery (URS). Intra-operatively, 90% stone clearance for the right kidney and complete stone clearance was achieved over the left ureteric stone. There was no growth in Urine C+S sent intra-operatively. Post-operatively, she did a DTPA scan which showed moderate impaired right kidney function (28ml/min-69%) with a non-functioning left kidney (13ml/min-13%). However, she is not keen on further intervention for her residual right renal stones and renal function had been closely monitored during follow-up in the urology clinic.

After 2 years of follow-up, her computed tomography urography (CTU) reassessment in 2018 showed persistent right renal stones and resolved left hydronephrosis. Subsequently, she agreed to right retrograde intrarenal surgery (RIRS) and ureteric stenting. Intraoperatively, complete stone clearance for right upper and middle pole; there were a few blackish tubular foreign bodies seen at right lower pole (Figures 2 and 3) which were extracted and sent for investigations. Interestingly, her histopathology (HPE) reported as blood clots while the fungal polymerase chain reaction (PCR) done by the Institute for Medical Research (IMR) showed *Aureobasidium pullulans* DNA detected. Post-operatively, she completed one-month course of anti-fungal antibiotic and discharged home well. Subsequent urine culture was cleared and CTU assessment showed no evidence of stone recurrence or foreign bodies.



**Figure 2.** Blackish rod-like foreign bodies and residual renal stones were seen intra-operatively



**Figure 3.** All the blackish tubular foreign bodies successfully extracted during RIRS

### 3. Discussions

In China, a total of 174 cases of phaeohyphomycosis have been reported from 1987 to 2021 by Huang et al [4]. Up to date, 70 genera and 150 species of fungi are documented as the causative agents of phaeohyphomycosis, such as *Fonsecaea*, *Curvularia*, and *Lomentospora* [5].

Phaeohyphomycosis is an opportunistic fungal infection that routinely implants to the skin after exposure to trauma, where a subcutaneous abscess is developed after a primary nodular lesion is formed. The process of inoculation is routinely found among farmers, gardeners, and agriculture [6]. In our scenario, she works as a farmer but has no dermatological lesions suggestive of fungal infection. Moreover, rising cases are reported in tropical or subtropical regions in view of the hot and humid climate.

Immunosuppression is a known risk factor such as organ transplant recipients, type II diabetes mellitus, malignancy, and chronic intake of systemic steroids contributes up to 78% of cases as reported in their case series [7],[8]. Interestingly, our patient is a fit and healthy young lady. Hence, instrumentation for stone surgeries would be a likely route for the inoculation of hyphae into her kidney.

Advancements in molecular biology have improved the technique of identification of causative organisms of mycosis via DNA extraction followed by sequencing [7]. In our case, fungal PCR was performed by the Institute for Medical Research (IMR) and showed that *Aureobasidium pullulans* DNA was detected.

Systemic anti-fungal treatment has shown superior outcomes in all forms of phaeohyphomycosis, except the fungal cyst. Surgical excision would be the recommended treatment of choice for cutaneous fungal cysts. Targeted choice of antifungal is the preferred treatment compared to empirical treatment after the causative hyphae have been identified. However, empirical antifungal therapy should be offered for selected cases such as patients who are on systemic steroid therapy or post-organ transplant patients. The most used medicine overall for 30 years in China for phaeohyphomycosis was itraconazole (39%), followed by voriconazole (9%); both itraconazole and voriconazole were applied equally (27%) for the disseminated lesions [9]. In our case, she was treated with itraconazole by the infectious disease team and discharged home well with a clear urine culture.

### 4. Conclusion

In summary, post-instrument inoculation after surgeries is a potential route that led to phaeohyphomycosis in an immunocompetent lady. Hence, disinfection and sterilization guidelines of surgical instruments must be strictly

adhered to by each hospital. Advancements in mycological diagnostic methods have significantly increased the detection rates of fungal infections. Systemic anti-fungal therapy is preferred with superior outcomes in treating phaeohyphomycosis. Targeted is better than empirical antibiotic treatment in managing fungal infections except for a selected group of immunocompromised patients.

## Declarations

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### Competing Interests Statement

The authors declare that they have no conflict of interest.

### Consent for publication

The authors declare that they consented to the publication of this study.

### Ethical Approval

Based on organizational guidelines.

### Authors' Contribution

All the authors took part in literature review, experimentation, and manuscript writing equally.

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